



Ron Larsen, Van Cleve Photography

A Honeybee Worker hovers over a flower, sucking up nectar with its tongue. These bees also gather pollen, which they carry in areas called *baskets* on their hind legs.

BEE

BEE is an insect that lives in almost every part of the world except near the North and South Poles. There are 10,000 *species* (kinds) of bees, but only honeybees make honey and wax that man can use. Bees are the only insects that produce food eaten by man. We use the wax from the nests of bees in making such products as candles and lipsticks. We use their honey in cooking and as a sweet spread on bread.

When bees fly from flower to flower, they help both man and the blossoms they visit. Many fruits and vegetables would die out if bees did not help fertilize flowers. Bees gather nectar and pollen from flowers. They make honey from the nectar and use the honey and pollen as food.

Some people are afraid of bees because they sting. But bees do not sting unless they are frightened or hurt. Like most other insects, bees have three pairs of legs and four wings. A bee has a special stomach, called a *honey stomach*, in which it carries nectar to the nest.

Honeybees are *social insects*. They live and work together in large groups. They form a *colony* (group) of

thousands of bees. A single honeybee may live only a few weeks or months, but the colony may go on living for many years. One worker bee can do little by itself, but the many thousands of workers in a colony, working as a group, can do many things. They fly into the fields and woods to gather food and water. They build their own home in a box, a hollow tree, or a bee hive. They store honey and pollen and eat it in winter, just as squirrels eat the nuts they store. Honeybees even air-condition their hive to keep it warm or cool.

The Honeybee Colony

Each colony includes three classes of honeybees: (1) the *queen*, which lays eggs; (2) the *workers*, which gather food and care for the young; and (3) the *drone*s, which fertilize the queen.

The honeybee colony is really a family home, where the workers provide food and shelter for the helpless young. The workers build the nest, collect and store honey, and do all kinds of housekeeping work. They guard the entrance to the nest against enemies. If necessary, they fight and die to protect the colony.

Men have studied the honeybee for hundreds of years. But we still do not know how the worker bees



Worker



Queen



Drone

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Three Kinds of Bees make up a honeybee colony. The colony consists of thousands of workers, one queen, and a few hundred drones.

know what to do or when to do it. We do not know how the workers decide when to build more honeycomb, how they know when the developing bees need more food, or how they decide to start queen cells in which to raise new queen bees.

The Nest. To build a *hive* (a nest with storage space for honey) the worker honeybees make some beeswax and shape it into a waterproof *honeycomb*. The honeycomb is a mass of six-sided compartments called *cells*. As soon as the workers have completed a few cells, the queen lays eggs in them. The workers enlarge the colony by building more cells, and the queen lays more eggs. Some workers fly out to gather nectar and pollen from flowers. See **NECTAR; POLLEN AND POLLINATION**.

The cells containing eggs and developing bees are in a round area in the center of the nest. This area is called the *brood nest*. The bees store pollen in cells above and on the sides of the brood nest. They put the nectar in cells above the pollen, where it later changes into honey.

The **Queen** honeybee lays the eggs that hatch into thousands of workers. Laying eggs is the queen's only job. She does not gather food or help build the nest. The workers feed her and care for her. The queen honeybee does not rule the colony, but she is the force that holds it together. The workers become excited and disorganized if she is not in the nest.

The Workers do all the chores in a honeybee colony except lay eggs. All workers are females, like the queen, but they are smaller than the queen. The worker has a long tongue for gathering nectar. It uses its hind legs to carry pollen.

The youngest workers clean empty cells, care for the young, help build the comb, and take care of the nectar. When a worker is 10 days to two weeks old, it flies to the fields where it collects nectar, pollen, and water for the young in the hive. On its outward flight, the worker flies here and there in search of food. When it has gathered as much as it can carry, it takes the *beeline* (shortest route) back to the hive. During the busy summer season, a worker usually lives about six weeks. It may live several months during the cold weather of fall, winter, and spring, when it has less work to do.

A worker returning to the nest from a food hunt uses a "dance" to tell its neighbors where food is. When the flowers are near the nest, the worker dances in circles. This dance stirs the others and they fly off to find the flowers. When the flowers are far from the nest, the worker dances in the direction of the flowers so the rest will know where to fly.

Several workers always stand guard at the nest entrance. All the bees in any hive have their own *hive odor*. The guards can tell when a stranger alights at the entrance, because it smells different. They attack and try to kill strange workers or strange queens, but they do not bother strange drones. Certain workers at the entrance fan fresh air into the hive, and force out the stale air. In winter, the workers gather in a loose cluster over the cells of honey. The movement of the workers' wings helps produce enough heat to keep the cluster and its queen at a temperature of about 50° to 60° F. (10° to 16° C). In summer, the air temperature in the brood area usually rises to around 93° F. (34° C).

Drones, or male honeybees, are burly, clumsy creatures. They do no work, and have no sting. They are raised in cells a little larger than those used for worker bees. Drones develop from unfertilized eggs. The only function of a drone is to mate with a young queen. An unmated queen can lay only drone eggs. She must be fertilized in order to lay worker eggs. Most drones are raised in late spring and early summer. In autumn, when the honey flow is over, the workers let the drones starve to death. This is done because they are no longer useful and would eat too much of the stored honey.

Enemies of bees include bears and Argentine ants. These and other thieves may destroy the hive in their search for honey. Skunks and dragonflies often eat worker bees. The wax moth may ruin a weak colony by eating the wax in the honeycomb. Worker bees try to protect the colony by stinging invaders to death, but they do not always succeed. An insect called the *bee assassin* makes a specialty of feeding on bees that it catches in flowers. Young and adult bees sometimes fall victim to such diseases as European foul brood and American foul brood. These diseases turn the young bees into a gummy, lifeless mass. Insecticides that are meant to kill other insects kill thousands of bees each year. Weed sprays take away an important source of bee

INTERESTING FACTS ABOUT BEES

Fossil Bees found trapped in amber probably lived 50,000,000 years ago.

A Honeycomb has walls that are only $\frac{1}{50}$ inch (0.3 millimeter) thick, but can support 30 times their weight.

The Largest Bee is a kind of bumblebee that is over 1 inch (2.5 centimeters) long. The largest honeybee, the oriental hive bee, is $\frac{3}{4}$ inch (19 millimeters) long.

Size of a Bee Colony. A strong, healthy colony may contain between 50,000 and 60,000 bees.

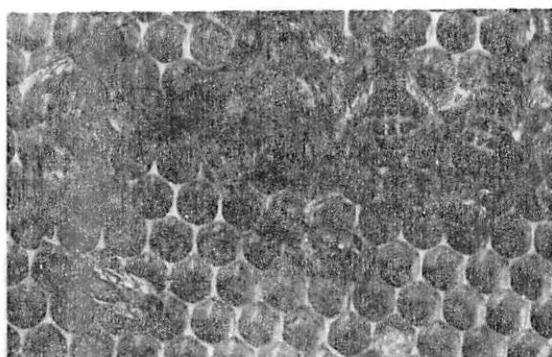
The Smallest Bee is *Trigona minima*, a stingless bee only $\frac{1}{8}$ inch (2 millimeters) long. The dwarf bee, the smallest honeybee, is under $\frac{1}{8}$ inch (10 millimeters).

Speed. Bees fly about 12 miles (19 kilometers) per hour.

Stinging requires a bee to use 22 different muscles.

Taste. Honeybees can identify a flavor as sweet, sour, salty, or bitter.

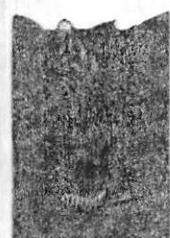
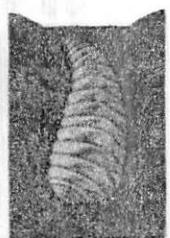
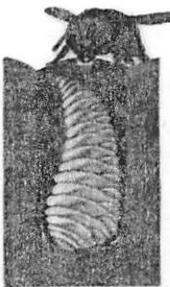
A Worker honeybee collects enough nectar in its lifetime to make about $\frac{1}{10}$ pound (45 grams) of honey.



E. R. Degginger

Workers Store Nectar and Pollen in some cells of the honeycomb. Other cells hold eggs and developing bees. One square inch (6.5 square centimeters) of honeycomb has about 25 cells.

STAGES IN THE LIFE OF A BEE

Egg laid
by queenGrub fed
by workerFull-grown
bee grubGrub sealed
in its cellGrub becomes
a pupaYoung adult
leaves cell

WORLD BOOK illustrations by James Tissot

food. The improper use of insecticides and weed sprays drives bees away from certain areas in the United States.

Life of the Honeybee

From Egg to Larva. Honeybee eggs are pearly white and about as big as the dot over this *i*. A bee starts to develop as soon as the queen lays the egg. After three days, a tiny wormlike *larva* crawls out of the egg. The workers place larval food, called *royal jelly*, in the bottom of each cell. Royal jelly is a creamy substance, rich in vitamins and proteins. It is formed by glands in the heads of young worker bees. When the larva is three days old, the workers begin feeding it a mixture of honey and pollen called *beebread*.

The workers build a wax cap over the cell five days

after the larva hatches. A great change then takes place. The wormlike larva becomes a *pupa*, then the pupa develops into an adult. The adult worker bee bites its way out of the cell 21 days after the egg is laid. Then it begins to work in the hive. Drones take 24 days to develop fully. See **LARVA**; **PUPA**.

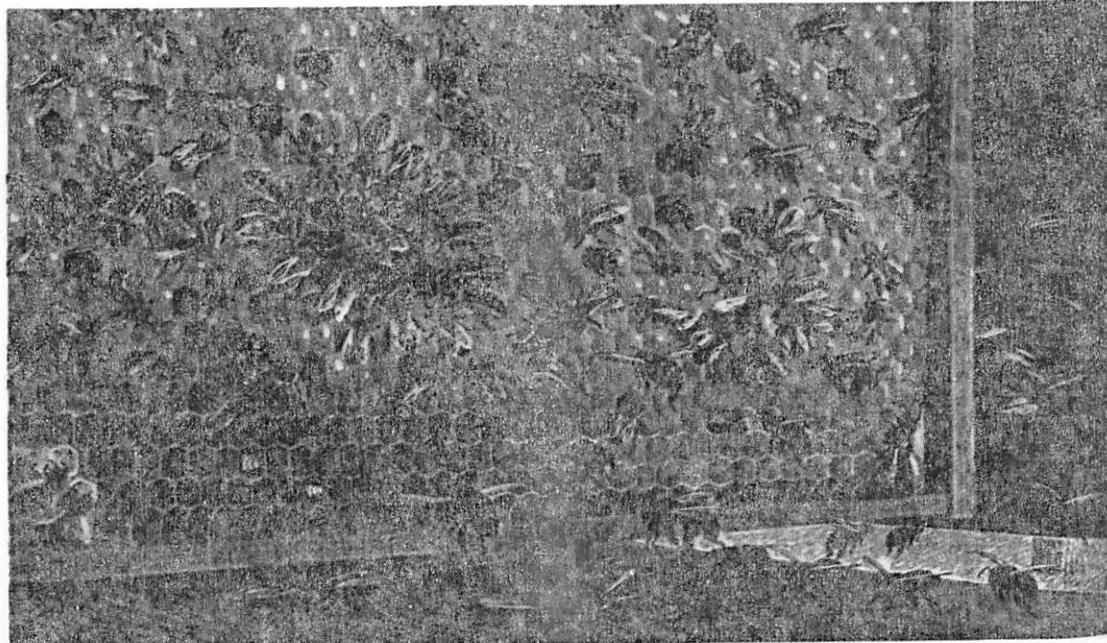
Growth of the Queen. A colony needs a new queen if the old queen disappears or becomes feeble, or if the old queen and part of the colony decide to leave and build a new hive.

In some unknown way, the workers select a few larvae to become queens. They feed these larvae only royal jelly. At the same time, other workers build special cells for the queens to grow in. A queen cell looks somewhat like half a peanut shell hanging from the

HIVE LIFE IN
SPRING AND SUMMER

Bees perform a variety of jobs in warm weather. Nurse bees, *left*, clean the empty cells and care for the grubs. The queen, *center*, lays eggs, one in a cell. Workers defend the hive by stinging an invading wasp to death, *bottom center*. Field workers, *right*, return to the hive loaded with nectar and pollen. Bees at the entrance to the hive fan in fresh air with their wings, *bottom right*.

WORLD BOOK illustration by James Tissot



honeycomb. About $5\frac{1}{2}$ days after hatching, the queen larva becomes a pupa. The young adult queen crawls out of the cell 16 days after the egg is laid. Scientists believe the bees may add a special substance to the queen's royal jelly to make her grow faster and have a different appearance from the workers.

Mating Flight. When the young queen emerges from her special cell, the bees in the colony pay little attention to her. She eats honey and gains in strength. If two queens hatch at the same time, they fight until one stings the other to death. The old queen may leave the colony, or she may fight with the young queen. After she has killed her rivals, the young queen flies from the hive. She may mate with one or sometimes several drones on her first flight or on a later flight. The young queen returns to the hive after she has mated, and begins to lay eggs two days later. After mating with only one drone, she can lay eggs for the rest of her life. A queen may live as long as five years. She may lay 2,000 eggs a day, more than 200,000 in a single season, and up to 1,000,000 eggs in her lifetime.

Swarming. When a colony becomes overcrowded, the old queen stops laying eggs. The workers build cells for new queens, and about four days later cover the cells with wax. A few days after the new queen cells are covered over with wax, many of the workers and the old queen leave the hive as a *swarm*. Their flight to form a new colony is called *swarming*. Some workers stay behind in the hive in order to care for the larvae and the new queen.

The swarm clusters around a branch or a post after

HIVE LIFE IN FALL

As cold weather sets in, the queen and workers cluster together on the honeycomb for warmth. They feed on honey that the colony stored up during the spring and summer. In this picture, bottom left, some workers, right, collect food out of full cells. Others, bottom right, push the drones out of the hive.

WORLD BOOK Illustration by James Teason



A Bee Swarm may include thousands of bees. They crowd around a branch while scouts search for a site to build a new hive.

leaving the hive. Scouts then seek out a location for the new colony. Some scouting may have occurred before the swarm left the hive. After deciding on a location, the swarm flies off to build its new nest.

Making Honey. Flowers have special glands, called *nectaries*, that produce nectar. Worker honeybees suck up nectar from the flowers with their long tongues, and store it in their honey stomachs. When the worker has

